Digital Therapeutics in the COVID-19 Pandemic: Clinical Applications and Future Potential

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Abstract

In the COVID-19 pandemic, the digital transformation of the healthcare system is accelerating. Among the digital healthcare technology, digital therapeutics (DTx) are attracting attention with clinical applications and future potential. Digital therapeutics treat various diseases, especially the chronic disease, and have immense potential in medical field. Global market of DTx is growing rapidly due to the high demands for healthcare and an aging population. In the US and Europe, DTx development and investment are actively being made. Although there is no DTx approved in Korea yet, it is necessary to discuss and prepare for an appropriate regulation, and improvement of accessibility for patients to activate DTx market in the future. This study examines the characteristics and clinical applications of overseas DTx and presents the potential for DTx to be used in Korea in the future.

Background

Digital therapeutics (DTx) is a new category of medicine. According to Digital Therapeutics Alliance, DTx delivers medical interventions directly to patients using evidence-based, clinically evaluated software to treat, manage, and prevent a broad spectrum of diseases and disorders.[1] DTx are provided to patients only through a doctor's prescription after their therapeutic effect has been verified through clinical research and approved by the regulatory authorities.

Unlike digital health, which aims to simply promote health, digital therapeutics directly treat and manage patients' diseases and disorders with proven technology. The main function of wellness products is to store, transmit and visualize health data. Examples of those are lifestyle or exercise tracking apps and medication reminder services. On the other hand, DTx can enter the market only after they are approved with safety and effectiveness because it is important for DTx to include therapeutic interventions that show clinical effects.

DTx are especially useful to treat chronic disease which normally lasts for more than 3 months. For chronic disease treatment, it is necessary for patients to change their lifestyle as they get treatment. However, if patients do not visit the hospital regularly, the treatment cannot be proceeded. In the COVID-19 pandemic, it became more and more difficult to visit hospital regularly. As the result, the value of DTx products became higher. DTx products offer at-home convenience and privacy, extend clinicians' ability to care for patients, and deliver high quality therapies to underserved populations.

According to Grand View Research (GVR), a US market research firm, the global DTx market is expected to reach $32.51 billion by 2030, growing at an average annual rate of 26.1% from about $5.09 billion in 2022.[2] GVR reported that due to COVID-19, increasing prevalence of chronic diseases anticipated to fuel the DTx market growth.

Methods

This study was conducted using literature review method.

Digital Therapeutics Alliance (DTA) is a non-profit trade association of industry leaders and stakeholders engaged in the evidence-driven advancement of digital therapeutics.[3] DTA provides necessary tools for stakeholders to evaluate and utilize DTx Products. With the reports and clinical trials paper provided by DTA, we were able to analyze the common strength and strategy of overseas market approved DTx.

There are about 40 digital therapeutics that have been approved by U.S. FDA since 2017. Among the list, the four DTx which are widely used and treat the diseases and disorders effectively were being studied in-depth. They are *reSET* for substance use disorder, *Somryst* for chronic insomnia, *Freespira* for PTSD and panic disorder, and *EndeavorRx* for ADHD.

Results

In September 2017, Pear Therapeutics' reSET became the first FDA-cleared Prescription Digital Therapeutic (PDT). Since then, the global digital therapeutics market attracted people's attention and is now growing rapidly.

reSET delivers cognitive behavioral therapy for substance use disorder along with contingency management and fluency training to enhance learning. It is consisted of 62 interactive modules that help patient to build skills to change behavior and prevent relapse. Patient can access to reSET easily through a smartphone or tablet, and the prescription duration is 12 weeks. reSET's pivotal study presented significant improvement in abstinence and treatment retention. Among all patients, adding reSET to outpatient therapy improved rates of retention from 63% to 76%. Patient who followed reSET module completion in the first six-weeks of the trial were seven times more likely to complete treatment than those who did not.[4]

Somryst is a 9-week Prescription Digital Therapeutic (PDT) for chronic insomnia. COVID-19 increased people's anxiety and affect people to suffer insomnia. DTx Somryst delivers digital Cognitive Behavior Therapy for Insomnia (CBT-I) therapeutic content, such as sleep restriction and consolidation, stimulus control and cognitive restructuring. During the treatment, patients complete their sleep diary every day and follow the sleep restriction and recommendations provided by Somryst. Results from the Somryst's pivotal studies showed that patients experienced a significant reduction in severity of insomnia after treatment, with more than 40% of the patient group no longer meeting the criteria for insomnia. [5]

Freespira is a PDT with mobile application, and it aim to treat the symptom of post-traumatic stress disorder (PTSD) and panic disorder. Freespira is composed of a proprietary sensor, physiological feedback display, and it train patients over 28-days to normalize the respiratory irregularities. A clinically supervised coach trains and support patients to use Freespira well. After patients use Freespira, physiological data from the app is uploaded to doctor's dashboard to present the user's respiration and CO2 levels. This information helps to personalize the specific coaching to support patient to develop the self-management skills and prevent panic attacks. Freespira brought great outcomes: 68% panic attack free at 12 months post-treatment; 93% clinically significant reduction in panic symptoms at 12 months post-treatment; and 91% treatment adherence. [6]

EndeavorRx is a PDT that is delivered through an action video game. It indicated to improve attention function as measured by computer-based testing in children aged 8-12 years old with ADHD who have demonstrated attention issues. The treatment programmed into the game which challenge a child's attentional control during gameplay, requiring focus and flexibility to complete multiple tasks at the same time. Since it is not a stand-alone therapeutic, it must be used as part of a therapeutic program. As the result, EndeavorRx demonstrated improvements in ADHD impairment (measured by Impairment Rating Scale), with responder rates ranging 48-50% after 1-month treatment and 68% following a second month of treatment. [7]

DTx Name	Condition Targeted	FDA Approval Date
reSET PEAR THERAPEUTICS	Substance use disorder (SUD)	2017.9.14
Somryst	Chronic Insomnia	2020.3.26
freespira	PTSD Panic Disorder Panic Attack	2018.8.23
EndeavorRx	ADHD	2020.6.15

Table 1. Digital Therapeutics approved by U.S. FDA

Discussion

DTx in Korea are still in the development stage. However, as R&D is being actively conducted in various clinical fields, it is expected that the DTx market in Korea will start soon.

The study of overseas DTx concludes that developers should prove the clinical effectiveness using Real World Evidence (RWE), design and develop DTx to be simple and easy for patients to use, and regulatory authorities should provide programs for rapid market entry of DTx. First, all the approved DTx had its evidence about the effectiveness of clinical interventions. If DTx has no effect on treatment, it will not be used. Secondly, DTx should be easy for patients to use. Chronic disease requires long-term treatment, and thus DTx must be designed with user-friendly features so that patients will use it continuously. It is important to identify the essential unmet needs of existing treatment and set only the core functions on the DTx. Lastly, if MFDS (Ministry of Food and Drug Safety) provides the programs which aims to rapidly disseminate innovative medical device, then developers will release the product with less burden because they may use Real World Data (RWD) as clinical trial results. The United States announced "the Digital Health Innovation Action Plan" and presented "a software pre-certification pilot program". This program pre-certifies companies with certain qualifications, let them first release the Medical Device, and then proceed post market surveillance with RWD. As a result, it was possible to improve safety and efficacy through efficient data collection, launch the product rapidly in the market, and develop individual product. With all stakeholder's effort, first DTx in Korea will be released soon.

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